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RECENT SIGHTINGS OF THE BLUE WHALE, *BALENOPTERA MUSCULUS*, IN THE NORTHEASTERN TROPICAL PACIFIC

The blue whale, *Balenoptera musculus*, in the North Pacific, migrates to the Gulf of Alaska and Aleutians in the summer for feeding (Nishiwaki 1966). It is believed to migrate to tropical waters in winter for calving, but sightings of blue whales in lower latitudes are rare (Tomilin 1957). In mid-July 1928, Cruikshank reported seeing "... several blue whales ..." at lat. 11°32'N and long. 91°58'W (Kellogg 1929). A Peruvian fishery reported taking 247 blue whales between December 1925 and March 1926 (Ingebrigtsen 1929). Potentially these were from a North Pacific stock, since the Southern Hemisphere blue whale is most numerous in the Antarctic at this time. Volkov and Moroz (1977) noted an abundance of baleen

whales between lat. 7° and 10°N. Although individual species of baleen whales were not enumerated by Volkov and Moroz, two sightings of blue whales were made on 29 March 1975 and are presented here (Table 1, *Vnushitelnyi* cruise).

Typically blue whales are seen along the Baja California coast in October while migrating southward, and subsequently reappear off Baja California in large numbers in March-June on their northward migration (Rice 1974). The whereabouts of the North Pacific blue whales during the winter months is completely unknown, but this is probably due to the lack of sighting effort. For instance, Japanese whale scouting has been carried out systematically since 1965, but their effort has been restricted to the Pacific waters north of lat. 20°N (Wada 1977).

Two theories have evolved regarding the wintering grounds of the blue whale. Wheeler (1946), suggested that blue whales winter within a limited area of the subtropics. He maintained that whales congregate in large groups in areas not frequented by vessels. A second theory maintains that wintering blue whales disperse between the feeding grounds and the tropics (Harmer 1931; Mackintosh 1942). Presented in this note is a 3-yr record of blue whales sighted in the northeastern tropical Pacific. Reference is made to migration, whale groupings, behavior, and to the oceanographic features of the sighting area. These recent sightings were made by trained observers aboard vessels involved with the National Marine Fisheries Service Tuna/Porpoise Research Pro-

gram. Sighting information from other experienced observers has also been contributed.

Shipboard identification of rorquals is difficult and this problem was compounded by the fact that most of the sightings mentioned in this paper were incidental to ship's activities. However, the blue whale is easily discerned from other rorquals by the recognition of the following combination of characteristics:

1. Mottled blue-grey coloration. All other rorquals are uniformly steel grey on the dorsal surface.
2. A small dorsal fin of varying shapes located in the posterior third of the body. The dorsal fin of the sei, fin, and brydes whales is larger, falcate shape, and placed farther anterior than the blue whale dorsal fin.
3. A U-shaped rostrum. The rostrum shape of other balenopterids is more pointed.
4. Tall, dense, disperse blows. Generally, the blow of the sei and brydes whales is low and dissipated, while the fin whale has a tall conical-shaped blow.

A total of 11 cruises are discussed in this report, covering the period from January to May for 1971, 1975, 1976, and 1977.¹ The area of effort and sightings of blue whales are reported in Figure 1. The

¹No blue whale sightings were made in 1977, although two cruises have been included in Figure 1 to complement survey effort.

TABLE 1.—Annotated list of blue whale sightings by National Marine Fisheries Service observers in the northeastern tropical Pacific, January-May 1971-76.

Date	Lat., Long.	No. of whales	Observations	Cruise/Observer
8 Jan. 1971	07°54' N, 095°52' W	1		<i>Nautilus</i> /Leatherwood
23 Jan. 1975	01°30' N, 083°04' W	1	Dove for 7 min	<i>Pan Pacific</i> /Friedrichsen
3 Feb. 1975	07°29' N, 093°48' W	cow and calf	3 dives, 5.57 min/dive; length, cow 27 m, calf 8-10 m	<i>Aquarius</i> /Wade
4 Feb. 1975	07°48' N, 097°40' W	1	Surfaced in middle of tuna school	<i>Finesterre</i> /Walker
7 Feb. 1975	07°45' N, 098°21' W	1	5 dives, 10.11 min/dive	<i>Aquarius</i> /Wade
7 Feb. 1975	07°47' N, 098°24' W	1	2 dives, 8.19 min/dive	<i>Aquarius</i> /Wade
7 Feb. 1975	07°52' N, 098°47' W	2	Small unidentified whale, 10 m, with visible blow, swimming with a large blue whale	<i>Aquarius</i> /Wade
7 Feb. 1975	07°47' N, 099°00' W	1	3 dives, 11.39 min/dive; exposed tail fluke on all dives	<i>Aquarius</i> /Wade
9 Feb. 1975	08°50' N, 096°04' W	4-6	Paired groups, length estimate: 27 m	<i>Pan Pacific</i> /Friedrichsen
10 Feb. 1975	08°33' N, 096°47' W	1		<i>Pan Pacific</i> /Friedrichsen
15 Feb. 1975	08°36' N, 096°29' W	1		<i>Pan Pacific</i> /Friedrichsen
17 Feb. 1975	08°58' N, 096°54' W	8-10	Mostly pairs dispersed over several square miles; all headed northeast	<i>Pan Pacific</i> /Friedrichsen
17 Feb. 1975	08°53' N, 096°36' W	1		<i>Pan Pacific</i> /Friedrichsen
29 Mar. 1975	08°55' N, 093°34' W	10-13		<i>Vnushitelnyi</i> /Rice
29 Mar. 1975	09°07' N, 093°55' W	6-7		<i>Vnushitelnyi</i> /Rice
13 Feb. 1976	09°44' N, 092°25' W	2		<i>Cromwell</i> /Friedrichsen et al
13 Feb. 1976	09°44' N, 092°31' W	1	Length estimate: 23 m	<i>Cromwell</i> /Friedrichsen et al.
13 Feb. 1976	09°44' N, 092°35' W	4-5	Whales dispersed over 4-5 mi ²	<i>Cromwell</i> /Friedrichsen et al.
13 Feb. 1976	09°44' N, 092°52' W	1	Exposed tail flukes prior to sounding	<i>Cromwell</i> /Friedrichsen et al.
28 May 1976	10°31' N, 092°45' W	1	Length estimate: 20 m	<i>Martinac</i> /Friedrichsen

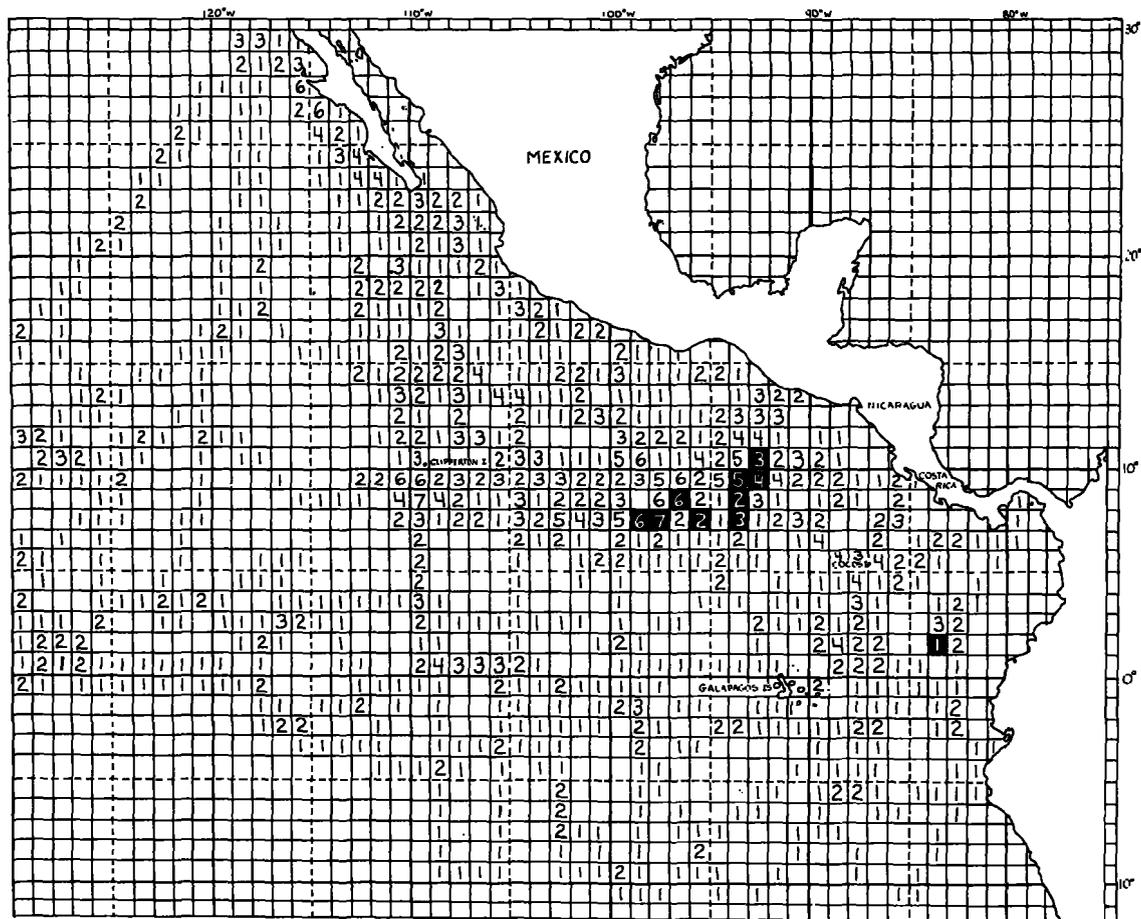


FIGURE 1.—Survey effort for blue whales in the northeastern tropical Pacific over 11 cruises from January to June in 1971, 1975, 1976, and 1977. Each numeral represents the total number of times that vessels entered a 1° block. Darkened blocks indicate blue whale sightings.

fact that blue whales have been sighted in the same general area for three winters indicates that North Pacific blue whales may have a distinct wintering ground to which they migrate each year.

The location of the suggested wintering grounds indicated by the sighting data are lat. 7°29'-10°31'N and long. 95°25'-99°00'W.² Only 1 of the 20 blue whale sightings (lat 1°30'N and long. 83°04'W, 23 January 1975, a solitary individual) was outside of these bounds. The equatorial sighting location of this whale may indicate that either it was not from the North Pacific population, or that North Pacific blue whales do not restrict migration to the hypothetical wintering grounds.

²Cruikshank's observations, in 1928, were also in this area.

Whale Groupings and Behavior

Blue whales are believed to be found singly or in pairs (Leatherwood et al. 1976). In fact, Nemoto (1964) reported that blue whales observed on the summer feeding grounds were solitary. However, five of the sightings reported here were aggregations of whales dispersed over several square miles. Many of the whales were paired. The multiple sightings on 7 February 1975 and 13 February 1976 appear to be mostly of solitary animals (Table 1). However, on both days, no less than 40 n. mi. separated the first and last whales sighted. Also, four out of the five whales observed on 7 February 1975 were headed in a northeasterly direction. This information may indicate that these apparently solitary whales were part of a large dispersed group.

At least one cow and calf were observed and possibly a second pair (Table 1). This is the first actual record of a blue whale calf in the tropics, although historically it has been believed that blue whales have their calves in the warm tropical waters (Mackintosh 1966:126).³

Oceanographic Features

There are several unique oceanographic features which relate to the sighting location of the blue whales. Cromwell (1958) and Wyrski (1964) discussed the Costa Rican Dome which is located at approximately lat. 9°N, long. 89°W. The dome is apparently a permanent topographic feature (150 km × 300 km) and is formed by the convergence of several major current systems. These currents typically create an area of nutrient transport or upwelling. High standing stocks of zooplankton in the area near the Costa Rican Dome (lat. 7°25'N-10°N) has been reported by several authors (Reid 1962; Blackburn et al. 1970; Holmes⁴). Volkov and Moroz (1977) suggested that the high stable food base of the area creates a habitat suitable for nonmigratory populations of baleen whales. North Pacific blue whales may also use this area for their winter feeding grounds.

In conclusion, the recent sightings of blue whales in the tropics indicates that North Pacific blue whales have a wintering area to which they return each year. Since most of the cruises have occurred largely during the winter months, more information must be collected to determine if whales are found in this area the year round. The high standing stock of zooplankton in this area may indicate that this is a winter feeding area, as well as a calving ground.

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³The average water temperature for 11 sightings was 26.5°C.

⁴Holmes, R. W. 1970. A contribution to the physical, chemical, and biological oceanography of the northeastern tropical Pacific. (Unpubl. manuscr.) Institute of Marine Resources, Scripps Institute of Oceanography, Univ. Calif. La Jolla, Calif. AEC-UCSD-34P99-4.

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SEX COMPOSITION, LENGTH-WEIGHT RELATIONSHIP, AND REPRODUCTION OF THE WHITE MARLIN, *TETRAPTURUS ALBIDUS*, IN THE WESTERN NORTH ATLANTIC OCEAN¹

In the Atlantic, white marlin, *Tetrapturus albidus*, range from lat. 35°S to 45°N with concentrations in the western Atlantic, including the Gulf of Mexico, and the Caribbean Sea (Mather et al. 1975). Tag returns show that some white marlin migrate seasonally from the U.S. Middle Atlantic Bight (the coastal area between Cape Cod and Cape Hatteras) in the summer to the southeastern Caribbean Sea in the winter (Mather et al. 1972). Commercial catches by Japanese longline vessels support the tagging results, but the catches also indicate that a second group of white marlin moves from a wintering area in the southeastern Caribbean to summer grounds in the Gulf of Mexico (Ueyanagi et al. 1970; Mather et al. 1972; Wise and Davis 1973).

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A substantial sport fishery exists for white marlin in the Atlantic off North and South America. In the United States, the major sport fisheries occur along the Middle Atlantic States, from New Jersey to North Carolina, off southeast Florida, and along the Gulf Coast States. Important sport fisheries also occur in the Bahamas, off Havana, Cuba, and along the coast of Venezuela (Mather et al. 1972). Another important sport fishery recently developed off eastern Brazil (Anonymous 1976).

The white marlin is also an incidental catch of commercial longline vessels fishing for tuna in the Atlantic and Gulf of Mexico (Mather et al. 1975). The marlin is highly prized as a food item in some countries (Kume and Joseph 1969).

My review of the literature on white marlin shows that there is a need for additional information on sex composition and length-weight relationships. Until recently, no information was available regarding its reproductive potential (Baglin²). In this paper I update reproductive and sex ratio data presented by Baglin (see footnote 2) and include length-weight relationships.

Materials and Methods

White marlin from the northern Gulf of Mexico (hereafter referred to as the gulf), the Florida Straits, the western Bahamas, and the Middle Atlantic Bight of the western North Atlantic (hereafter referred to as the Atlantic) were sampled from anglers' catches at sport fishing tournaments and at Pflueger Marine Taxidermy, Inc., Hallandale, Fla. One marlin was collected by longline in the Windward Passage between Cuba and Hispaniola during RV *Oregon* Cruise 66.

Sex data were obtained from 1,128 white marlin captured by anglers in the gulf (1971-77) and from 720 white marlin caught by anglers from the Atlantic (1972-77).

Lengths and weights were obtained from 904 white marlin captured in the gulf (1971-76) and from 489 white marlin captured in the Atlantic (1972-76). Body lengths (straight distance from tip of lower jaw to tips of midcaudal rays) were measured in centimeters (Rivas 1956); weights were recorded to the nearest pound and converted to kilograms.

²Baglin, R. E., Jr. 1977. Maturity, fecundity and sex composition of white marlin (*Tetrapturus albidus*). *Collective Volume of Scientific Papers* 6(79):408-416. International Commission for the Conservation of Atlantic Tunas, Madrid, Spain.